THURSDAY, SEPTEMBER 25, 1884

MODERN STEAM PRACTICE AND ENGINEERING

Modern Steam Practice and Engineering. By John G. Winton, assisted by W. J. Millar, C.E. (London: Blackie and Sons, 1883.)

THE want has long been felt by those employed in the engineering works of this country of a book which shall serve as a guide to the various operations in the workshop, giving a practical yet concise description of the various methods employed, and the reason for using any particular method. In some works we find the business conducted in an old-fashioned stereotyped way, and in others all the latest improvements are introduced. The number of workmen who can give the real reason for using any particular method is very small, the reason generally given being, "The work has always been done that way?" It is here where the apprentice finds one of the many difficulties he has to overcome; he can see the work done, but cannot fathom the reason for doing it any particular way; his foreman perhaps being too busy to help him, he has to do the best he can.

The volume before us will go a long way towards solving this difficulty. The author, being a practical man, treats the subject in a thoroughly practical way, using the technical language of the shops, thereby making the various descriptions and plates throughout the volume exceedingly clear. At the same time the higher principles involved in the various machines described are not overlooked, so that it is also a valuable book of reference in the drawing office, as well as a useful companion to those who have charge of men engaged in the various branches of mechanical engineering. For students attending the workshops and classes of the various engineering colleges it will be found to be very useful, giving as it does a *practical* description of the work, and helping considerably to get that knowledge which can alone be got in the workshops of the country.

The book is divided into five sections, subdivided into chapters.

Section I. is on the boiler and steam, commencing with a short chapter on coal and coal-mining. The author gives a short account of the troubles of the miner, and tells us of the methods in use for lining the shafts. Ventilation is dealt with; the various exhaust fans are next mentioned, with an illustration of the gimbal fan; then the author goes on to the usual methods for getting the coal. The chapter is a very appropriate commencement to the volume, although it gives a rather short account of the coal-mining industry.

We then come to a long chapter on stationary boilers, giving a good description of the various types in use. We miss the Lancashire boiler, with its two flues and conical water-tubes, from the illustrations. The author discusses the strength of riveted joints, giving the results of some experiments. We should have liked to find here a short account of the important researches on the strength of riveted joints carried out by Prof. Kennedy at the Engineering Schools of University College, London. The strength of cylindrical boilers is gone into fully, the various strains tending to rupture the plates are pointed out, and tables are given showing the proper thickness of plates for the different diameters. It is impossible here to give anything like a complete *résumé* of this chapter, no pains having been spared to get together as much information as possible; the author has succeeded in making it one of the most useful chapters in the work. He goes on to the foundations and settings for the different types of boiler, giving an account of the dimensions for the chimney. Smoke prevention is discussed, the conclusion at which the author arrives being thus stated: "We unhesitatingly give as our opinion that unless the attendant sees that the furnace is kept in proper trim, firing with the least quantity of coal, ofttimes replenished, all the refinements for the prevention of smoke will not attain the desired object, for careful firing is the main secret to arrive at."

Boilers for marine purposes are dealt with in a similar manner, the various types being discussed and illustrated. The arrangement of boilers for ships of war is gone into, high-pressure boilers having a fair share of the text. The proportions of marine boilers are treated, and suitable rules given for calculating the various dimensions, the chapter concluding with an illustration of the boilers of the s.s. *Parisian*, of the Allan Line of Atlantic steamers.

After showing the various methods for superheating and drying the steam by means of superheaters, both tubular and cylindrical, the author explains the methods of manufacture of boilers, more especially the best arrangement of plates and angle iron, and the staying of flat surfaces. We agree with the author when he says that this subject closely affects the interests of steam users, and the extract from a report of the National Boiler Insurance Company is well worth studying. Section I. concludes with the regulation and expansion of steam. The action of the slide valve is thoroughly explained, and the benefits derived from lap and lead pointed out. The different arrangements of the link motion are illustrated and clearly explained, then equilibrium slide valves are discussed and the arrangements clearly illustrated. The action of the indicator and the mode of driving the roller cylinder is shown; some very good examples of indicator diagrams taken from simple and compound engines are given; the section closing with a short chapter on the expansion of steam, with tables of hyperbolic logarithms, and the properties of saturated steam at different pressures.

Section II. is entirely devoted to stationary engines, commencing with the Cornish pumping-engine, afterwards dealing with the several different types of pumping-engines,—as pumping-engines for water-works, drainage works, and general purposes. The reader will here grasp the immense amount of trouble the author has taken to get all the information together, down to the smallest detail; each class of engine being well illustrated, its leading features pointed out, and the explanations of the different parts being very clear. Nor are the underground appliances overlooked, the pumps, valves and other parts in connection with the gear are thoroughly described and illustrated.

Pumping-engines for water-works are very similar to those used for draining mines. We have several good examples; the description of the Tottenham pumping-engines is very interesting; and we have another example in the engines of the Berwick-on-Tweed Waterworks.

Of pumping-engines for drainage purposes, the London drainage system furnishes perhaps the best possible example; the Abbey Mills pumping-station with its eight engines giving an aggregate of 1140 horse-power, capable of dealing with 15,000 cubic feet of sewage per minute, lifting it 36 feet high; the Deptford pumping-station, with a horse-power of 500, lifting 10,000 cubic feet of sewage per minute to a height of 18 feet. The pumping-engines at Crossness are also described, having a collective horse-power of 500, dealing with 10,000 cubic feet of sewage per minute, with a varying lift of from 10 to 30 feet according to circumstances.

After a short account of an arrangement of centrifugal pumping machinery, the author deals with winding engines, giving a clear description of this class, and as an example we have a full-page engraving of an engine for the Benhar Coal Company, by Messrs. Gibb and Hogg, Airdrie.

The various types of blowing-engines are described; afterwards rolling-mill engines, having as examples some engines erected at the Dowlais Ironworks, and compound reversing rail-mill engines at the Hallside Steel-works, near Glasgow: these latter are shown in a full-page engraving and are fully described in the text.

Under water-pressure engines we find the accumulator and charging pumps illustrated, the hydraulic crane, and the usual hydraulic machinery for dock gates is described, the section concluding with an account of the hydraulic machinery for warehousing grain at the Liverpool Docks and a full-page engraving of hydraulic machine tools, designed by Mr. R. H. Tweddell.

In Section III. we have the marine engine thoroughly and completely explained. We here see what a tremendous advance has been made in the science of marine engine building, the engines of the latest additions to our mercantile navy being nearly theoretically perfect as far as the economical consumption of steam is concerned, and the proportions of the different parts more in accordance with the individual strains they have to withstand. The author treats the subject fully, each part and detail being illustrated, and reasons given for any peculiarity of construction in the engines described; he then goes on to screw propellers, and kindred appliances, the section concluding with a full-page engraving of the compound engines of the steam-ships *Servia* and *Parisian*, the descriptions being very clear and to the point. Rules for the horizontal marine engine finish the section.

Perhaps the locomotive engine, which is treated in Section IV., has advanced by greater strides than any other machine within the last twenty years, the reasons being that the traffic on the railways has got heavier, competition has forced the companies to run the trains at higher speeds, at the same time that the vehicles composing the trains have increased both in size and weight.

This increase means that the engine must have a higher tractive power, which can only be got by increasing the weight on the driving-wheels; larger cylinders must be used, and consequently a larger boiler and fire-box for the increased consumption of steam. As an example of an express passenger locomotive of the present day, we may take the engines designed by Mr. Stirling for the Great Northern Railway, having driving-wheels 8 feet in diameter, cylinders 18 inches in diameter with a stroke of 2 feet 4 inches. Compare these engines with one built fifteen or twenty years ago, and the marvellous change will be at once apparent.

The author commences the section with a variety of fire-boxes designed to consume the smoke when burning coal, some being very complicated. All locomotives of the present day burn coal, and from the very complicated fire-boxes illustrated, the fire-box has resolved itself into a perfectly plain box, having a brick arch, to mix the products of combustion previous to their passage through the tubes. This when fired properly is quite capable of consuming all the volatile hydrocarbons in the coal without the formation of any smoke.

The illustrations in the earlier part of the section are somewhat old-fashioned; the one showing the stays inside a locomotive boiler might have been of more recent design. We remember having seen a boiler of the same type on a locomotive built in 1847. With this as the only drawback, the section treats the subject in a clear and practical way; we do not know of any work in which one can find so much information.

In the description of the American locomotive, one finds many arrangements which look strange to those accustomed to English practice, but we cannot notice any peculiarity which we think could be adopted in this country with advantage. After a short account of the different classes of automatic continuous brakes, in which the Westinghouse and vacuum automatic brakes are discussed, we have some very good examples of the latest locomotive practice of this country. The engraving showing the vertical and horizontal sections of a bogie passenger engine, for the Caledonian Railway, is very clear, and the description good. Afterwards we find engines for the Great Northern, London and North-Western, and North British Railways thoroughly and clearly discussed, the general constructions being explained. The section concludes with a specification for a bogie locomotive, designed by Mr. William Kirtley for the London, Chatham, and Dover Railway, and a set of rules are compiled for the construction of locomotives.

In Section V. there is a very interesting and useful account of the construction of iron ships. The section of necessity treats the subject generally, the scope of iron shipbuilding being so large. The transverse and longitudinal methods of construction are explained, an account is given of the late Mr. William Froude's experiments with ship models, and as an example of recent practice we have the longitudinal section and deck plans of the s.s. *Orient*, with a concise description of her construction; afterwards the rigging is explained, with illustrations of the sparring and sail plan of a full-rigged ship. Then comes a short account of armoured war-ships, with a description of H.M.S. *Polyphemus*, the section concluding with dredgers, and examples of specifications for iron ships to Lloyd's rules.

Under the head of engineering works, the author gives a description of floating docks, the construction of iron roofs, the construction of, and strain on, wrought-iron girders. There is a very clear analysis of the strains on the struts and ties in the lattice girder; the construction and sectional area of each strut and tie is worked out; next the suspension bridge is discussed, the general construction being explained.

The last few subjects treated in the volume include the fire-engine and gas-engine, with several other short accounts of the newest inventions, concluding with a chapter on the strength of materials.

In the publishers' preface we read that the present work is intended to furnish a reliable guide to practical engineers and others connected with the engine-shop and building-yard. This end has been most satisfactorily accomplished, and both authors and publishers may be congratulated on having placed before the public a most useful book; the printing is exceedingly clear, and the illustrations in the text good; the separate series of engraved plates add much to the value of the volume, without which many long descriptions would have been necessary. The book deserves a place in every technical library in the country. Those learning any branch of mechanical engineering will do well to study it, for it is one of the few really practical works published.

OUR BOOK SHELF

Catalogue and Handbook of the Archæological Collections in the Indian Museum. Part II. By John Anderson. (Calcutta.)

WE have already drawn attention to the first part of this excellent Catalogue, which thoroughly fulfils its promise of being not only an exhaustive list of the valuable objects in the Indian Museum, but a scholarly guide to them as well. The second part is occupied with Buddhist, Jain, Brahminical, and Mohammedan sculptures, and with the collections from Southern India, Persia, and other parts of the East. Appendixes have been added at the end of the book, including two by Prof. Warden and Mr. Growse. The work will be of great value to students of Indian archæology, and more especially to those who are devoting themselves to Buddhistic research. The Indian Museum is naturally a storehouse of antiquities throwing light on the past history of India and its relations with the West, and these have now been brought to the knowledge of scholars in a thoroughly satisfactory way.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Barnard's Comet

LAST night (September 22) this comet was well seen in the 3-foot telescope. It was large (at least 4′ over), brighter to the middle, but without nucleus; a position was measured from a faint star involved in the light of the head. At 8h. 20m. the position by circle reading was α 19h. 45m. 50s., and 117° 16′ 30″ N.P.D. A. A. COMMON

Ealing, September 23

The Krakatoa Eruption

BY this morning's post I have received, in a rather roundabout way from India, a translation of a Dutch account of the Krakatoa eruption, which, if you have not had it already, seems to contain some interesting variations on, or additions to, the mass of matter that you have already printed on that subject. Indeed the only postscript that could now be well added to it is the comfortable and encouraging discovery of the late French scientific expedition to the effect that the eruption is now positively over. The Batavians, as you are probably aware, feared that another eruption was preparing, in consequence of the immense number of stones still being ejected and clouds of smoke emitted. But the French *savants* discovered that no stones were being thrown up, only immense quantities of them tumbling down the mountain's sides; and this because the material, of which those new sides of the mountain are now composed, is so extraordinarily friable that the heat of the sun each day breaks them up, and the quiet force of gravitation brings the pieces galloping down the steep slopes, and plunging at last into the sea, to the danger of passing vessels,—but only by day, and when the sun is shining, for at night everything is quiet; and if by day and night a cloud forms above the mountain-top, it is neither smoke nor gaseous emanation, but merely the infinitely fine powdery matter of the broken-up and rolling stones of the day rising into the air and moving along with its currents up along the slopes which have been warmed by the sun.

C. PIAZZI-SMYTH

15, Royal Terrace, Edinburgh, September 15

The Sky-Glows

I WAS not aware before reading Mr. Leslie's letter in NATURE of the 11th inst. (p. 463) that any of the phenomena supposed to be connected with the volcanic dust had been seen before the eruption of Krakatoa in May 1883. Would the whole text of the description of those seen in February 1883 in Natal, from which Mr. Leslie gives a quotation, indicate them to be exactly similar to those seen since the great eruption? Where can a description of them be found?

The remarkable sunsets reported as seen in Mauritius after May 1883 and before the great eruption of Krakatoa, were by some attributed to the earlier volcanic disturbance, while others have expressed doubts whether they were really similar to those so generally noticed last autumn and winter.

It was not in the least the purpose of my former letter to imply the necessity of visiting a mountainous country to see the red corona round the sun; I am aware it is still plainly visible in England, and do not doubt even in London in fairly clear weather, having observed it when there in May last, not only within an hour of sunset or sunrise, but at all times of the day. But I wished to draw your readers' attention to the fact that this corona is much better seen in the clearer air at great altitudes, where also it is not necessary, as in England, that the sun be hidden by a cloud for it to be well seen.

I had not seen it stated before that the phenomena have been visible in England for years past. There is much more to be seen than a "blanching of the sun," as Mr. Leslie calls it, so that perhaps we are not both discussing the same phenomenon. Besides the bluish or greenish light immediately round the sun, which is not very striking, there is a broad red or brown band beyond, which is so. Has this been seen in England previous to last November? It has been habitual for me to scan the neighbourhood of the sun for halos during twenty-five years, and I never observed it previously to the date mentioned. It is true that the circumstances favourable for producing halos are unfavourable for seeing the red ring; nevertheless, since the latter first appeared in November I have not unfrequently seen it at the same time with a halo. It is also true that I saw portions of this red ring some days before I recognised them as a new phenomenon, but then they were only visible in gaps between clouds, so that I took them to be on thin cloud, and simply examples of the nacreous hues of thin films; any large extent of sky would probably have enabled me to perceive their true character. It is therefore very difficult for me to believe that the corona was visible in this country much, if at all, before last November.

Whether the phenomenon is ordinarily noticeable in volcanic countries I have not learnt; information from observers in such places would be of much value towards the elucidation of this interesting question. I gather from Prof. G. H. Stone's statement (NATURE, vol. xxix. p. 404) that a somewhat similar appearance is commonly visible in Colorado, where it may perhaps be attributed to the higher layers of dust of that very dusty region. T. W. BACKHOUSE

Sunderland, September 20